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basic education

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION/  
NATIONAL SENIOR CERTIFICATE EXAMINATION

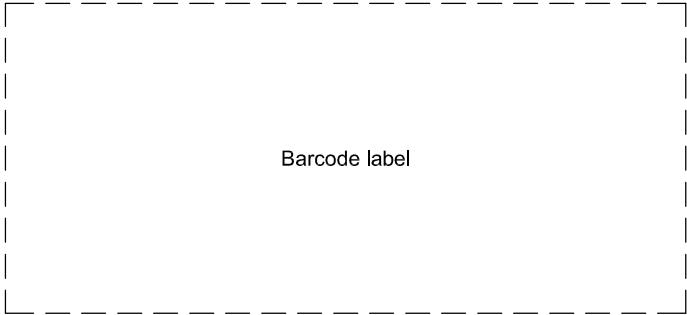
ENGINEERING GRAPHICS AND DESIGN P2

2023

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.



INSTRUCTIONS AND INFORMATION

1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
4. ALL drawings must be prepared using pencil and instruments, unless otherwise stated.
5. ALL answers must be drawn accurately and neatly.
6. ALL the questions must be answered on the QUESTION PAPER, as instructed.
7. ALL the pages, irrespective of whether the question was attempted or not, must be re-stapled in numerical sequence in the TOP LEFT-HAND CORNER ONLY.
8. Time management is essential in order to complete all the questions.
9. Print your examination number in the block provided on every page.
10. Any details or dimensions not given must be assumed in good proportion.

FOR OFFICIAL USE ONLY															
QUESTION	MARKS OBTAINED			$\frac{1}{2}$	SIGN	MODERATED			$\frac{1}{2}$	SIGN	RE-MARKING			$\frac{1}{2}$	SIGN
1															
2															
3															
4															
TOTAL															
	2	0	0			2	0	0			2	0	0		

FINAL CONVERTED MARK	CHECKED BY
100	

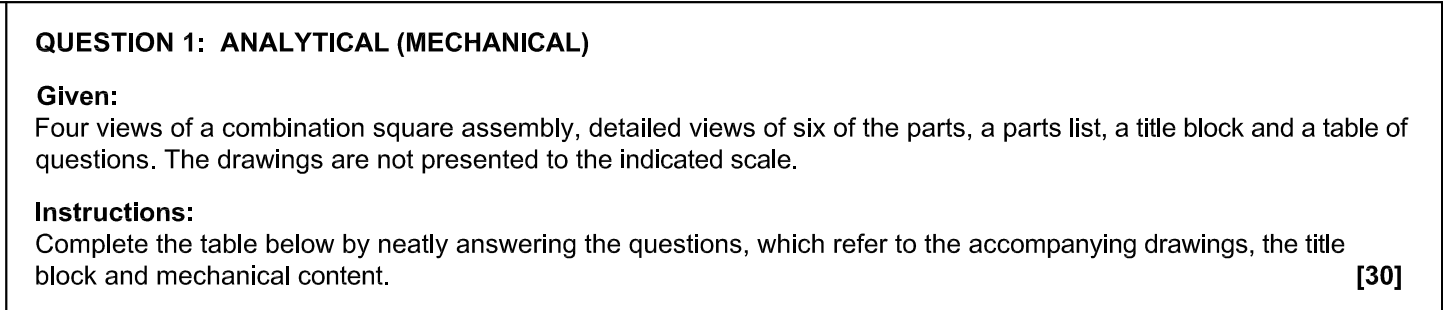
COMPLETE THE FOLLOWING:

CENTRE NUMBER

CENTRE NUMBER

EXAMINATION NUMBER

EXAMINATION NUMBER



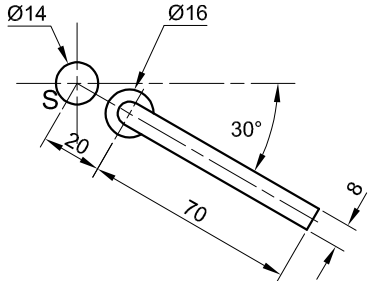
**QUESTION 19:**

**ANSWER 20:**



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S+



ROLLER-FOLLOWER AND CAMSHAFT DETAIL

QUESTION 2: LOCI (CAM)

- Given:**
- The detail of a camshaft and a roller-follower at the **minimum** distance from the camshaft centre
  - The position of centre point S on the drawing sheet

- Specifications:**
- The roller-follower reciprocates along the 30° centre line that passes through the centre of the camshaft.
  - Rotation = clockwise

- Motion:**
- The cam imparts the following motion to the roller-follower:
- It moves outward from the given position to the maximum displacement of 66 mm with uniform acceleration and retardation over the first 180°.
  - There is a dwell period for the next 45°.
  - It then moves 32 mm inward with simple harmonic motion over the next 90°.
  - It returns to its original position with uniform motion over the remainder of the rotation.

- Instructions:**
- Using centre point S on the drawing sheet, draw, to scale 1 : 1, the camshaft and roller-follower at the given minimum distance.
  - Draw to a rotational scale of 360° = 120 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
  - Using the given position of the follower as 0°, project and draw the cam profile from the displacement graph.
  - Show the direction of rotation of the cam profile with an arrow.
  - Label the displacement graph.
  - Show ALL construction and projection. **[39]**

ASSESSMENT CRITERIA					
1	GIVEN + MINIMUM DISTANCE + CL	5			
2	GRAPH CONSTRUCTION + LABELS	6			
3	PLOTTING GRAPH + GRAPH CURVES	9 1/2			
4	CAM CONSTRUCTION + ARROW	5			
5	PLOTTING + CAM PROFILE	13 1/2			
PENALTIES (-)					
TOTAL		39			
EXAMINATION NUMBER					
EXAMINATION NUMBER					3

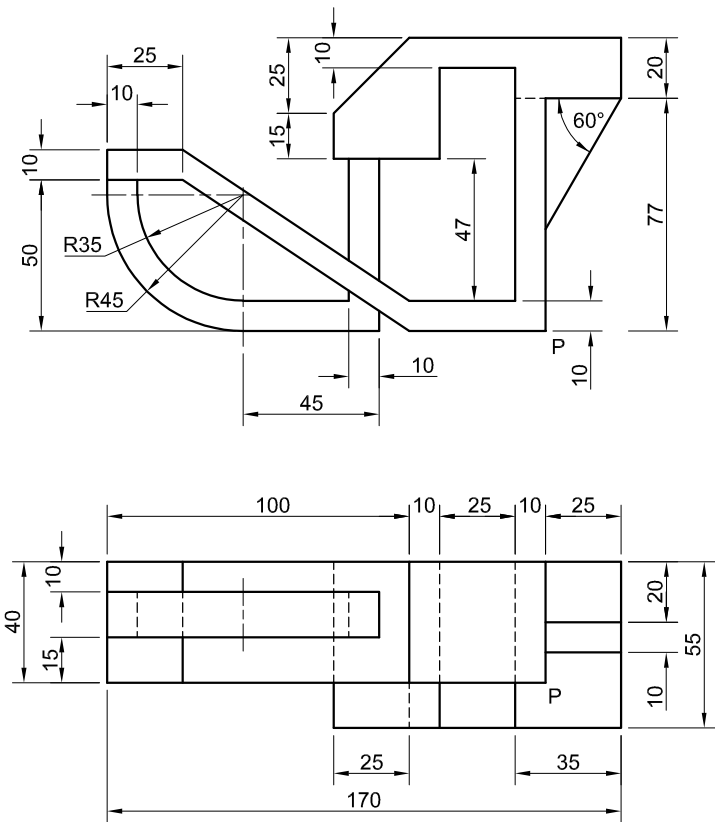


QUESTION 3: ISOMETRIC DRAWING

- Given:**
- The front view and top view of a sliding guide
  - The position of point P on the drawing sheet

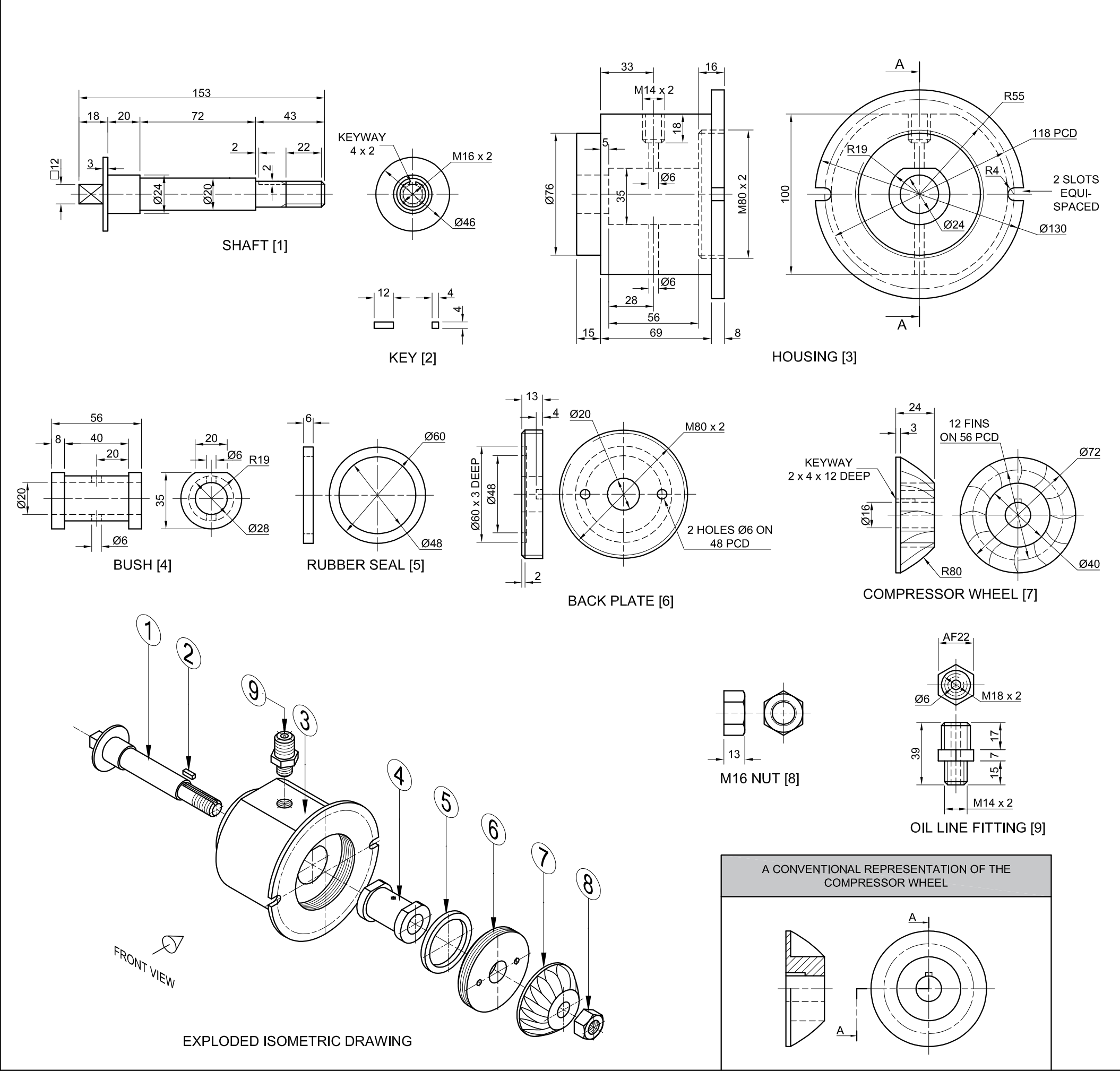
**Instructions:**  
Using scale 1 : 1, convert the orthographic views of the sliding guide into an isometric drawing.

- Use P as the starting and lowest point of the drawing.
  - Show ALL construction.
  - NO hidden detail is required.
- [38]



P

ASSESSMENT CRITERIA				
1	PLACING + AUX. VIEW	1 1/2		
2	BASE	18 1/2		
3	WEB	2 1/2		
4	CIRCLE + CENTRE LINES + BRACE	15 1/2		
PENALTIES (-)				
TOTAL		38		
EXAMINATION NUMBER				
EXAMINATION NUMBER				4



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a turbo core assembly, showing the position of each part relative to all the others
  - Orthographic views of each of the parts of the turbo core assembly
  - A conventional representation of the compressor wheel (part 7)

- Instructions:**
- Answer this question on page 6.
  - Draw, to scale 1 : 1 and in third-angle orthographic projection, the following views of the assembled parts of the turbo core assembly:
    - 4.1 A sectional front view** on cutting plane A-A, as seen from the direction of the arrow on the exploded isometric drawing. The cutting plane is shown on the right view of the housing (part 3).
    - 4.2 The right view**

- NOTE:**
- Planning is essential.
  - ALL drawings must comply with the *SANS 10111* guidelines.
  - The convention of symmetry may NOT be applied.
  - Show THREE faces of the M16 nut (part 8) in the front view.
  - Draw the compressor wheel (part 7) as a conventional representation.
  - NO hidden detail is required.

[93]

PARTS LIST			
PART		QUANTITY	MATERIAL
1	SHAFT	1	STAINLESS STEEL
2	KEY	1	MILD STEEL
3	HOUSING	1	CAST IRON
4	BUSH	1	BRASS
5	RUBBER SEAL	1	RUBBER
6	BACK PLATE	1	ALUMINIUM
7	COMPRESSOR WHEEL	1	ALUMINIUM ALLOY
8	M16 NUT	1	MILD STEEL
9	OIL LINE FITTING	1	MILD STEEL

**JVBW**  
ENGINEERING CC

7 POWER AVE  
CORON PARK  
www.speedy.co.za  
091 345 6147

**TURBO CORE**

ALL DIMENSIONS ARE IN MILLIMETRES.



5



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INCORRECT ORTHOGRAPHIC PROJECTION	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
RIGHT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	HOUSING + SHAFT	6 <sup>1</sup> / <sub>2</sub>			
2	BACK PLATE + COMPRESSOR WHEEL	3			
3	M16 NUT	2 <sup>1</sup> / <sub>2</sub>			
4	OIL LINE FITTING	2 <sup>1</sup> / <sub>2</sub>			
SUBTOTAL		14 <sup>1</sup> / <sub>2</sub>			
SECTIONAL FRONT VIEW					
1	SHAFT	12 <sup>1</sup> / <sub>2</sub>			
2	KEY	2			
3	HOUSING	18			
4	BUSH	5 <sup>1</sup> / <sub>2</sub>			
5	RUBBER SEAL	4			
6	BACK PLATE	3 <sup>1</sup> / <sub>2</sub>			
7	COMPRESSOR WHEEL	8			
8	M16 NUT	4			
9	OIL LINE FITTING	10			
SUBTOTAL		67 <sup>1</sup> / <sub>2</sub>			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	8			
SUBTOTAL		11			
TOTAL		93			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					6